Project Update 2

ECEN 5833: Low Power Embedded Design Techniques

CUBIT

Smart Measuring Instrument

Team Name: Cubit

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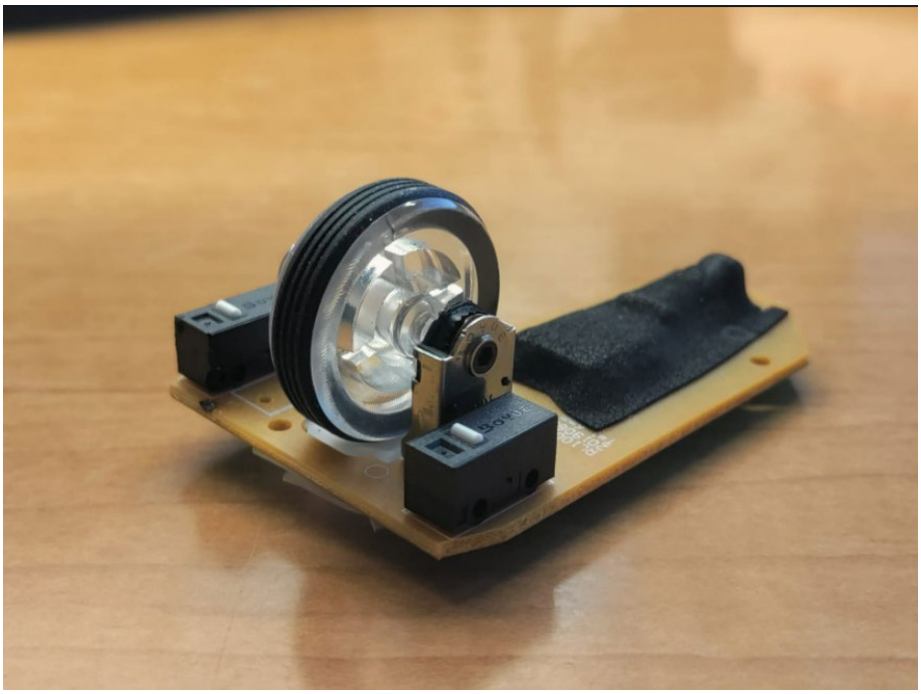
Date: 01/29/2022

Activities accomplished in past week:

- Studied mouse scroll-wheel encoder assemblies to decide the decide the mechanical assembly for final product. Disassembled 4 different optical mouses to explore different assemblies.



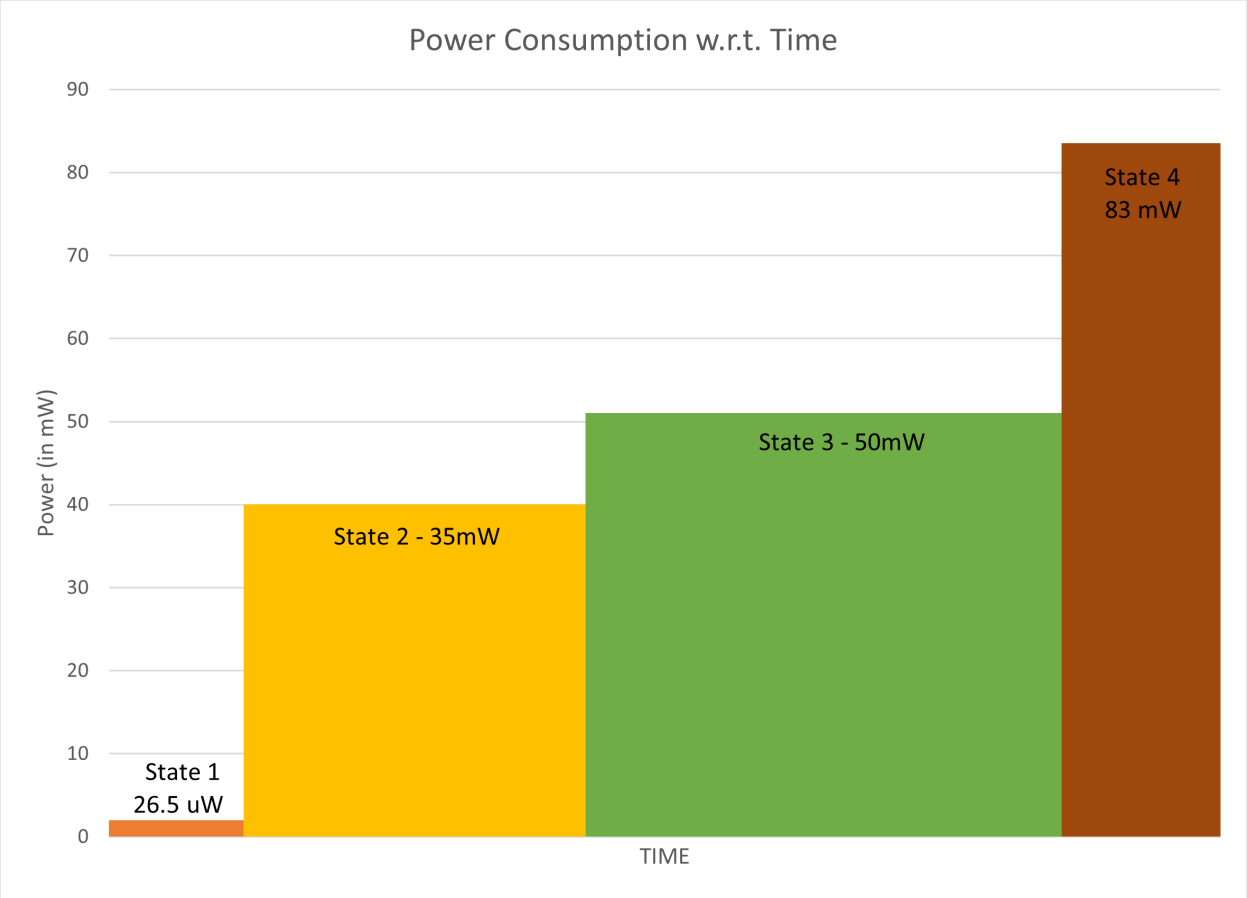
Scroll wheel encoder assembly

- Measured PPR(Pulse per rotation) of rotary encoder and circumference of wheel to estimate linear measurement resolution.
- Finalized ultra-low power Graphic LCD display.
- Estimated total power and energy consumption of the product.
- Worked on project planning and estimated timeline.

Activities for the coming week:

- Finalize battery and solar panel based on energy consumption requirements.
- Finalize Power management IC.
- Work on power supply circuit for the product.

Energy model for the product:



Product Components:

Component		Part No.
Microcontroller	Silicon Labs Blue Gecko	
Radio	EFR32BG13	
Battery	Lithium Ion/Lithium Polymer	TBD
Sensor	IMU sensor	BNO005

	Rotary Encoder	Existing mouse wheel encoder assembly
	Ultrasonic Sensor	Adafruit ultrasonic sensor
HMI	LCD Display	Adafruit SHARP Memory Display Breakout - 1.3"
	Push Buttons (4)	Available
Energy Harvesting System	Solar cells	TBD

Sensor selection:

1. IMU Sensor: BNO005
   - This sensor works on I2C as well as UART.
   - We will be interfacing the sensor using I2C as data transfer over UART communication takes longer and even though it consumes less energy, overall efficiency of UART decreases. Moreover, for transfer of larger data bytes I2C consumes the same amount of energy. (These assumptions were made using this reference.)
   - This sensor will require external load switch as after start-up it only enters low power mode and suspend mode. (Even in suspend mode it consumes 40uA of current).

2. Rotary encoder
   - This mechanical encoder has just 2 digital pins which can be wired directly as input to the controller. The encoder generated pulses gives the angular position of the axis and can then be converted to digital output.
   - The encoder will also require external load switch as it does not have internal circuitry to turn power off.

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Program Flowchart: